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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/508,753	Applicant(s) SCHOWENGERDT ET AL.
	Examiner Behrooz Senfi	Art Unit 2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-41* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09/22/2004* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date see attached.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. The restriction requirement as set forth in the Office action mailed on 04/18/2007, has been reconsidered in view of the applicant's remarks, filed 05/15/2007. The restriction species requirement as indicated in the Office action mailed on 04/18/2007 is hereby withdrawn.

Drawings

2. The drawings were received on 09/22/2004. These drawings are accepted by the examiner.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 41 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 41, the limitations "beam splitter reflecting light **from one of** the image source and a real world scene, so that the viewer can **simultaneously** view the **real word scene and the image provided by the image source"** as indicated in lines 2 – 4 of claim 41 is vague and indefinite, in that it is unclear how the viewer can **simultaneously** view both images "e.g. the **real word scene and the image provided by the image source"** when the beam splitter is reflecting light **from**

only one of the image source "e.g. either real world scene or image provided by the image source", as stated in the claim. The clarification is required.

For the purpose of art rejection, claim 41 is rejected as best understood by the examiner.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 2, 5 – 10, 12, 15, 17, 19 – 21, 24 – 29, 31, 34, 36, 38 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sullivan (US 2002/0163482) in view of Shevlin (US 2003/0086062).

Regarding claim 1, Sullivan '482 teaches, a method for more accurately conveying depth in an image (i.e. fig. 1, multi-planar display system, page 2, paragraph 0013, page 4, paragraphs 0050 and 0057 and page 5, paragraph 0064 of Sullivan) comprising; a) displaying an image to a viewer on a large depth of focus display (please see; figs. 1 and 4 - 7, multi-planar display system, for displaying an image to a viewer 12 on a large depth of focus display, page 2, paragraph 0013, page 3, paragraphs 000024, 0026 and page 4, paragraph 0057 of Sullivan);

c) displaying an image having an apparent focus plane (please see, figs. 1, 4 – 7, 9 and 16, page 9, paragraph 0103 and page 10, paragraphs 0104 – 0105 and page 13, paragraph 0144 of Sullivan, illustrates image having an apparent focus plane "e.g.

such as apparent focus planes 36 – 42 of fig. 1 of Sullivan") so that the accommodation "e.g. focusing" of the viewer watching the large depth of focus display changes, the image that is displayed is changed to more accurately convey depth in the image that is displayed (please see; fig. 1, when the accommodation "e.g. focusing" of the viewer 12 watching the large depth of focus display changes "for example, the images on the large depth of focus display 36 – 42, varies, e.g. changes, based on the accommodation of viewer 12 to more accurately convey depth in the image that is displayed, as shown in fig. 1", page 13, paragraph 0144 of Sullivan).

Although, Sullivan '482 states, eye accommodation "e.g. focusing" with respect to the viewer who is watching the image on the large depth of focus display (i.e. page 13, paragraph 0144). But is silent in regards to explicit of "determining an accommodation "e.g. focusing" for an eye of the viewer, and track accommodation of the viewer".

Shevlin '062 teaches, determining an accommodation "e.g. focusing" for an eye of the viewer, and track accommodation of the viewer (please see; fig. 1, page 2, paragraph 0028, indicating eye tracking system for monitoring "e.g. tracking" the look direction and accommodative state of the viewer, of Shevlin).

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the display system of Sullivan in accordance with the teaching of Shevlin, by using an eye tracking system for monitoring the look direction and accommodative state of the viewer, in order to simulate a wide field of view, high resolution colour scene, with low aberration, as to stimulate optically

the user's accommodative system, as suggested by Shevlin (i.e. page 1, paragraph 0011, lines 6 – 9 of Shevlin).

Regarding claim 2, Although, Sullivan '482 states, eye accommodation "e.g. focusing" of at least one eye with respect to the viewer who is watching the image on the large depth of focus display (i.e. page 13, paragraph 0144). But is silent in regards to explicit of "directly measuring the accommodation".

Shevlin '062 teaches, "directly measuring the accommodation" (please see; fig. 1, page 2, paragraph 0028 of Shevlin, eye tracking system for directly monitoring "e.g. measuring" the direction and accommodative state of the viewer eye).

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the display system of Sullivan in accordance with the teaching of Shevlin, by using an eye tracking system for directly monitoring the look direction and accommodative state of the viewer eye, in order to simulate a wide field of view, high resolution colour scene, with low aberration, as to stimulate optically the user's accommodative system, as suggested by Shevlin (i.e. page 1, paragraph 0011, lines 6 – 9 of Shevlin).

Regarding claim 5, the combination of Sullivan and Shevlin teaches, the method further comprising the step of rendering in real time "e.g. figs. 1 and 15, the MVD system 10 performs image rendering, page 11, paragraph 0120 of Sullivan" in real-time "e.g. page 4, paragraph 0053 of Sullivan", each image having an apparent focus plane that tracks the accommodation "e.g. focus" of the viewer, on the large depth of focus display (please see; figs. 1 and 15, multi-planer display system, with apparent focus

plane that tracks the accommodation "e.g. focus plane as illustrate in fig. 1, elements 36 – 42 and viewer 12" to be presented to the viewer 12, page 4, paragraph 0053 and page 14, paragraphs 0156 – 0157 of Sullivan).

Regarding claim 6, the combination of Sullivan and Shevlin teaches, wherein objects within each image that are farther away from the apparent focus plane in the image are rendered at a lower resolution and contrast, to substantially reduce a computational overhead required for rendering the image on the large depth of focus display (please see; fig. 1, where the MVD system 10 performs image rendering "e.g. page 11, paragraph 0120" and figs. 21 – 24 of Sullivan, illustrates object within image that are near and/or far from the focus plane, and page 15, lines 2 – 10, indicating depth dependent image processing, reducing the contrast of deeper images "e.g. farther image" and reducing the brightness of deeper image "e.g. consider as lower the resolution" of Sullivan).

Regarding claim 7, the combination of Sullivan and Shevlin teaches, pre-preparing a plurality of images having a range of different apparent focus planes, so that the image having the apparent focus plane that tracks the accommodation of the viewer is selected from the plurality of images that were pre-prepared (please see; figs. 1, 4 – 7 and 23 - 24 "e.g. it is noted that, figs. 1 and 4 – 7 of Sullivan, illustrates plurality of images having a range of different apparent focus planes for selective imaging to generate a three dimensional image from the plurality of images" page 4, paragraph 0057, page 10, paragraph 0106 and page 11, paragraph 0118 and page 14, paragraph 0157 of Sullivan).

Regarding claim 8, the combination of Sullivan and Shevlin teaches, wherein the plurality of images are arranged in a multi-dimensional array, at least one axis of the multi-dimensional array corresponding to a disposition of the apparent focus plane in the plurality of images (please see; figs. 1 and 4 – 7 of Sullivan, illustrates plurality of images are arranged in a multi-dimensional array, and one axis of the multi-dimensional array would correspond to a disposition of the apparent focus plane, of Sullivan).

Regarding claim 9, the combination of Sullivan and Shevlin teaches, wherein each other dimension of the multi-dimensional array corresponds to a different parameter that varies within the plurality of images (please see; fig. 1, controller 18, page 11, paragraph 0118, page 12, paragraph 0128, where the controller 18 carries out the parameters that varies within the plurality of images, of Sullivan).

Regarding claim 10, the combination of Sullivan and Shevlin teaches, enabling the viewer to provide an input that varies a value of a parameter for at least one of the other dimensions, to affect the image provided to the large depth of focus display (please see figs.1 and 15, user feed back device 58 and interface 14 and page 5, paragraph 0064, where the user feed back device 58 is used through the interface 14 to provide a value to control and change parameter, thus effect the image rendering provided to the large depth of focus display, such as shown in fig. 1, where the images 24, 26, 28 and 30 are different, of Sullivan).

Regarding claim 12, the combination of Sullivan and Shevlin teaches, wherein the image that is displayed by the large depth focus display is a image (e.g. figs. 1 and 4 – 7, illustrates image being rendered and displayed by the large depth focus display,

of Sullivan) so that the 21/2 dimensional image can be rendered (e.g. fig. 9, illustrates images may focused "e.g. rendered" at a normal, minimum and/or maximum distance on the plane, which obviously would have different dimension "e.g. as shown in fig. 9, the maximum can be consider as 21/2 dimension with respect to normal distance image and/or minimum distance image") image can be rendered at a desired apparent focus plane using the depth information for the image (please see; fig. 1, MVD controller, page 11, paragraph 0121 and page 12, paragraph 0133, it is noted that, image is being generated/rendered with consideration of size "e.g. desired size of image" and desired depth, of Sullivan; further; it is noted that, by changing the size of the image "for example, to smaller size" the computational overhead would be reduced, less processing takes effect, which reduces the computational overhead).

Regarding claim 15, the combination of Sullivan and Shevlin teaches, producing successive images having apparent focus planes that track the accommodation of the viewer, at a sufficiently fast image rate to produce a perception of motion of an object within the successive images (please see, fig. 1, multi-planar display 32 with apparent focus planes that track the accommodation of the viewer 12, page 7, paragraph 0080, indicating image frame rate to produce a perception of motion of an object within the successive images of Sullivan).

Regarding claim 17, the combination of Sullivan and Shevlin teaches, employing a graphic rendering algorithm to blur object that are not disposed at the apparent focus plane in the image (please see, fig. 1, illustrates the graphic rendering, element 16 – 18

and page 14, paragraph 0157, depth of focus blur to be added by applying blur filter of increasing strength to images of increasing distance on the focus plane of Sullivan).

Regarding claim 19, the combination of Sullivan and Shevlin teaches, wherein the image that is displayed by the large depth of focus display is in a non-planar "e.g. three-dimensional (3D) image which has more than two-dimension consider as non-planar" (please see; page 3, paragraph 0045 of Sullivan).

Regarding claim 20, Sullivan '482 teaches, a system for more accurately conveying depth in an image (i.e. multi-planar display system 10 as shown in fig. 1, generates 3D images with more accurate depth in the image, page 2, paragraph 0013, page 4, paragraphs 0050 and 0057 and page 5, paragraph 0064 of Sullivan) comprising;

a) a large depth of focus display (please see; figs. 1 and 4 – 7, the large depth multi-planar focus display system of Sullivan);

b) an image source that cooperates with the large depth of focus display to produce an Image that can be viewed (please see; fig. 1, elements 16 – 20, cooperates with the large depth of focus display 32 to produce an Image that can be viewed by the user 12, of Sullivan);

d) a computing device coupled to the image source and to the device, the computing device carrying out a plurality of functions (please see, fig. 1, computing device 14 and 18 for computing and rendering the images to be presented to the viewer 12, of Sullivan); including

(i) displaying the image to a viewer on a large depth of focus display (please see; figs. 1 and 4 - 7, multi-planar display system, for displaying an image to a viewer 12 on a large depth of focus display, page 2, paragraph 0013, page 3, paragraphs 000024, 0026 and page 4, paragraph 0057 of Sullivan);

(iii) displaying an image having an apparent focus plane (please see, figs. 1, 4 – 7, 9 and 16, page 9, paragraph 0103 and page 10, paragraphs 0104 – 0105 and page 13, paragraph 0144 of Sullivan, illustrates image having an apparent focus plane "e.g. such as apparent focus planes 36 – 42 of fig. 1 of Sullivan") so that the accommodation "e.g. focusing" of the viewer watching the large depth of focus display changes, the image that is displayed is changed to more accurately convey depth in the image that is displayed (please see; fig. 1, when the accommodation "e.g. focusing" of the viewer 12 watching the large depth of focus display changes "for example, the images on the large depth of focus display 36 – 42, varies, e.g. changes, based on the accommodation of viewer 12 to more accurately convey depth in the image that is displayed, as shown in fig. 1", page 13, paragraph 0144 of Sullivan).

Although, Sullivan '482 states, eye accommodation "e.g. focusing" with respect to the viewer who is watching the image on the large depth of focus display (i.e. page 13, paragraph 0144). But is silent in regards to explicit of, device that monitors at least one eye of a viewer to produce a signal indicative of an accommodation of the at least one eye, and determining an accommodation "e.g. focusing" for an eye of the viewer, and tracks the accommodation of the viewer, as specifies in the claim.

Shevlin '062 teaches, device that monitors at least one eye of a viewer to produce a signal indicative of an accommodation of the at least one eye (please see; fig. 1, page 2, paragraphs 0028 – 0029, where indicates monitoring at least one eye of a viewer and producing control signal with respect to accommodative state of the viewer eye, of Shevlin) and determining an accommodation "e.g. focusing" for an eye of the viewer, and track accommodation of the viewer (please see; fig. 1, page 2, paragraph 0028, indicating eye tracking system for monitoring "e.g. tracking" the look direction and accommodative state of the viewer, of Shevlin).

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the display system of Sullivan in accordance with the teaching of Shevlin, by using an eye tracking system for monitoring the look direction and accommodative state of the viewer, in order to simulate a wide field of view, high resolution colour scene, with low aberration, as to stimulate optically the user's accommodative system, as suggested by Shevlin (i.e. page 1, paragraph 0011, lines 6 – 9 of Shevlin).

Regarding claim 21, Sullivan '482 teaches, eye accommodation "e.g. focusing" of at least one eye with respect to the viewer who is watching the image on the large depth of focus display (i.e. page 13, paragraph 0144).

Sullivan '482 is silent in regards to explicit of "device emits light", as specifies in the claim.

Shevlin '062 teaches, device emits light for directly measuring the accommodation in at least one eye of the viewer (please see; fig. 1, page 2, paragraph

0028 and page 3, paragraphs 0054, 0062 of Shevlin, eye tracking system 3 and optical system 23 for directly monitoring "e.g. measuring" accommodative state of the viewer eye).

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the display system of Sullivan in accordance with the teaching of Shevlin, by using an eye tracking system for directly monitoring the look direction and accommodative state of the viewer eye, in order to simulate a wide field of view, high resolution colour scene, with low aberration, as to stimulate optically the user's accommodative system, as suggested by Shevlin (i.e. page 1, paragraph 0011, lines 6 – 9 of Shevlin).

Regarding claim 24, the combination of Sullivan and Shevlin teaches, the method further comprising the step of rendering in real time "e.g. figs. 1 and 15, the MVD system 10 performs image rendering, page 11, paragraph 0120 of Sullivan" in real-time "e.g. page 4, paragraph 0053 of Sullivan", each image having an apparent focus plane that tracks the accommodation "e.g. focus" of the viewer, on the large depth of focus display (please see; figs. 1 and 15, multi-planer display system, with apparent focus plane that tracks the accommodation "e.g. focus plane as illustrate in fig. 1, elements 36 – 42 and viewer 12" to be presented to the viewer 12, page 4, paragraph 0053 and page 14, paragraphs 0156 – 0157 of Sullivan).

Regarding claim 25, the combination of Sullivan and Shevlin teaches, wherein objects within each image that are farther away from the apparent focus plane in the image are rendered at a lower resolution and contrast, to substantially reduce a

computational overhead required for rendering the image on the large depth of focus display (please see; fig. 1, where the MVD system 10 performs image rendering "e.g. page 11, paragraph 0120" and figs. 21 – 24 illustrates object within image that are near and/or far from the focus plane, and page 15, lines 2 – 10, indicating depth dependent image processing, reducing the contrast of deeper images "e.g. farther image" and reducing the brightness of deeper image "e.g. consider as lower the resolution" of Sullivan).

Regarding claim 26, the combination of Sullivan and Shevlin teaches, wherein the plurality of images having a range of different apparent focus planes, so that the image having the apparent focus plane that tracks the accommodation of the viewer is selected from the plurality of images that were pre-prepared (please see; figs. 1, 4 – 7 and 23 - 24 "e.g. it is noted that, figs. 1 and 4 – 7 illustrates plurality of images having a range of different apparent focus planes for selective imaging to generate a three dimensional image from the plurality of images" page 4, paragraph 0057, page 10, paragraph 0106 and page 11, paragraph 0118 and page 14, paragraph 0157 of Sullivan).

Regarding claim 27, the combination of Sullivan and Shevlin teaches, wherein the plurality of images are arranged in a multi-dimensional array, at least one axis of the multi-dimensional array corresponding to a disposition of the apparent focus plane in the plurality of images (please see; figs. 1 and 4 – 7, illustrates plurality of images are arranged in a multi-dimensional array, and one axis of the multi-dimensional array would correspond to a disposition of the apparent focus plane, of Sullivan).

Regarding claim 28, the combination of Sullivan and Shevlin teaches, wherein each other dimension of the multi-dimensional array (e.g. the 3D image as shown in fig. 1 of Sullivan, consider as multi-dimensional array) corresponds to a different parameter that varies within the plurality of images (please see; fig. 1 of Sullivan, where shows the size varies within the plurality of images "such as, fig. 1, plurality of images 24 – 30 having different size/parameter" page 11, paragraph 0118, page 12, paragraph 0128 of Sullivan).

Regarding claim 29, the combination of Sullivan and Shevlin teaches, wherein the computing device (e.g. MVD controller 18) responds to a user input that varies a value of a parameter for at least one of the other dimensions, causing a corresponding change in the image on the large depth of focus display (please see figs.1 and 15, page 5, paragraph 0064 of Sullivan, where user feed back device 58 through the interface 14 is used to provide a value to control and change parameter, thus effect the image rendering provided to the large depth of focus display, such as shown in fig. 1 of Sullivan, where the images 24, 26, 28 and 30 are different).

Regarding claim 31, the combination of Sullivan and Shevlin teaches, wherein the image source displays a 21/2 dimensional image on the large depth focus display (e.g. as shown in fig. 9, the image source 20 displays the image in the maximum "which consider as 21/2 dimension with respect to normal and/or minimum distance image"), so that the 21/2 dimensional image can be rendered by computing device (e.g. fig. 9, illustrates images may focused "e.g. rendered" at a normal, minimum and/or maximum distance on the plane, which obviously would have different dimension "e.g. as shown in

fig. 9, the maximum can be consider as 21/2 dimension with respect to normal distance image and/or minimum distance image") at a desired apparent focus plane using the depth information for the image to reduce computational overhead (please see; fig. 1, MVD controller, page 11, paragraph 0121 and page 12, paragraph 0133, it is noted that, image is being generated/rendered with consideration of size "e.g. desired size of image" and desired depth of Sullivan, it is noted that by changing the size of the image "for example, to smaller size" the computational overhead would be reduced, less processing takes effect, which reduces the computational overhead).

Regarding claim 34, the combination of Sullivan and Shevlin teaches, producing successive images having apparent focus planes that track the accommodation of the viewer, at a sufficiently fast image rate to produce a perception of motion of an object within the successive images (please see, fig. 1, multi-planar display 32 with apparent focus planes that track the accommodation of the viewer 12, page 7, paragraph 0080, indicating image frame rate to produce a perception of motion of an object within the successive images of Sullivan).

Regarding claim 36, the combination of Sullivan and Shevlin teaches, employing a graphic rendering algorithm to blur object that are not disposed at the apparent focus plane in the image (please see, fig. 1, illustrates the graphic rendering, element 16 – 18 and pages 11, paragraph 0122 and 14, paragraph 0157, depth of focus blur to be added by applying blur filter of increasing strength to images of increasing distance on the focus plane of Sullivan).

Regarding claim 38, the combination of Sullivan and Shevlin teaches, wherein the image that is displayed by the large depth of focus display is in a non-planar (please see; page 3, paragraph 0045 of Sullivan, e.g. three-dimensional (3D) image which has more than two-dimension consider as non-planar).

Regarding claim 41, the combination of Sullivan and Shevlin teaches, beam splitter reflecting light from one of the image source and a real world scene, so that the viewer can simultaneously view the real world scene and the image provided by the image source (please see; figs. 1, 4 – 7 and beam splitter 106 in fig. 9, page 10, paragraph 0104, indicating beam splitter 106 reflecting light from the image source so that the viewer can view the image on the large depth of focus display, of Sullivan).

7. Claims 3, 16, 18, 22, 35, 37, 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sullivan (US 2002/0163482) in view of Shevlin (US 2003/0086062) further in view of Tabata (US 6,449,309).

Regarding claim 3, the combination of Sullivan and Shevlin teaches, determining eye accommodation "e.g. state of focus" of the viewer watching the large depth of focus display, as discussed earlier with respect to claim 1 above.

The combination of Sullivan and Shevlin does not explicitly states, measuring a vergence of at least one eye of the viewer, and determining the accommodation as a function of the vergence, as specifies in the claim.

Tabata '309 teaches, measuring a vergence of at least one eye of the viewer (please see; fig. 6, elements 36 and 38, figs. 9, 12 and 22 – 23, col. 7, lines 13 – 19 of

Tabata, indicates measuring the viewer's eyeball vergence angle) and determining the accommodation as a function of the vergence (please see; fig. 25, illustrates the relation "e.g. function" between accommodation and vergence, accommodation as a function of the vergence of Tabata)

In view of the above it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify Shevlin's display device in accordance with the teaching of Tabata by obtaining the actual vergence of the viewer's eyes at the viewing point (i.e. col. 21, lines 21 – 24 of Tabata), thus improves display apparatus for alleviating the departure from the natural sense of viewing and fatigue of the viewer and further reduce calculation time, cost and data transmission capacity and to obtain binocular parallax control matched to the viewer's actual eyeball vergence angle, as suggested by Tabata (i.e. col. 1, lines 15 – 16 and col. 21, lines 21 – 24 and col. 7, lines 21 – 24 of Tabata).

Regarding claim 16, the combination of Sullivan and Shevlin teaches, apparent focus plane that tracks the accommodation of the viewer, as discussed earlier with respect to claim 1 above (please see; figs. 1, 4 – 7, 9, pages 13 - 14, paragraph 0144 – 0146 of Sullivan, illustrates apparent focus planes 36 - 42).

The combination of Sullivan and Shevlin does not explicitly states "element that is laterally shifted, so that each eye sees a different image" as specifies in the claim.

Tabata '309 teaches, element that is laterally shifted "e.g. shift amounts of a right eye and left eye image" corresponding to the eyeball accommodation (please see; figs. 1 and 6, col. 11, lines 43 – col. 12, lines 10 and col. 14, lines 19 – col. 21, lines 10, shift

amounts of a right eye and left eye image corresponding to the eyeball accommodation, and supplies signals representing the necessary shift amounts to image shifters 32R and 32L on a right eye and left eye 11R and 11L, so that each eye sees a different image, as shown in fig. 15a-c of Tabata).

In view of the above it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the multi-planar display system of Sullivan in accordance with the teaching of Tabata by supplying the eyeball accommodation to the shift amount calculator to process the right eye and left eye image signals from an image to provide proper binocular parallax regarding the right and left eye images and control state of focus of viewer eyes instantaneously, as suggested by Tabata (i.e. col. 4, lines 10 – 13 and col. 11, lines 64 – col. 12, lines 10 of Tabata).

Regarding claim 18, the combination of Sullivan and Shevlin teaches, determining accommodation of the viewer eye, as discussed earlier with respect to claim 1 above.

Shevlin is silent in regards to explicit of, "light that is not visible to a human, to measure the accommodation for the eye of the viewer" as specifies in the claim.

Tabata '309 in the same field teaches, light source for projecting infrared light/rays toward the viewer eyeball to determine eyeball accommodation of the viewer (please see; col. 11, lines 59 – 66 of Tabata).

In view of the above it would have been obvious to one having ordinary skill in the art at the time of the invention was made to determine the accommodation as taught

by Shevlin in accordance with the teaching of Tabata by using a light source for projecting infrared light/rays to viewer eyeball to detect and control state of focus of viewer eyes instantaneously, as suggested by Tabata (i.e. col. 4, lines 10 – 13 of Tabata).

Regarding claim 22, the combination of Sullivan and Shevlin teaches, determining eye accommodation "e.g. state of focus" of the viewer watching the large depth of focus display, as discussed earlier with respect to claim 1 above.

The combination of Sullivan and Shevlin does not explicitly states, measuring a vergence of at least one eye of the viewer, and determining the accommodation as a function of the vergence, as specifies in the claim.

Tabata '309 teaches, measuring a vergence of at least one eye of the viewer (please see; fig. 6, elements 36 and 38, figs. 9, 12 and 22 – 23, col. 7, lines 13 – 19 of Tabata, indicates measuring the viewer's eyeball vergence angle) and determining the accommodation as a function of the vergence (please see; fig. 25, illustrates the relation "e.g. function" between accommodation and vergence, accommodation as a function of the vergence, of Tabata)

In view of the above it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify Shevlin's display device in accordance with the teaching of Tabata by obtaining the actual vergence of the viewer's eyes at the viewing point (i.e. col. 21, lines 21 – 24 of Tabata), thus improves display apparatus for alleviating the departure from the natural sense of viewing and fatigue of the viewer and further reduce calculation time, cost and data transmission capacity and

to obtain binocular parallax control matched to the viewer's actual eyeball vergence angle, as suggested by Tabata (i.e. col. 1, lines 15 – 16 and col. 21, lines 21 – 24 and col. 7, lines 21 – 24 of Tabata).

Regarding claim 35, the combination of Sullivan and Shevlin teaches, apparent focus plane that tracks the accommodation of the viewer, as discussed earlier with respect to claim 1 above.

The combination of Sullivan and Shevlin does not explicitly states "element that is laterally shifted, so that each eye sees a different image" as specifies in the claim.

Tabata '309 teaches, element that is laterally shifted "e.g. shift amounts of a right eye and left eye image" corresponding to the eyeball accommodation (please see; figs. 1 and 6, col. 11, lines 43 – col. 12, lines 10 and col. 14, lines 19 – col. 21, lines 10, shift amounts of a right eye and left eye image corresponding to the eyeball accommodation, and supplies signals representing the necessary shift amounts to image shifters 32R and 32L on a right eye and left eye 11R and 11L, so that each eye sees a different image, as shown in fig. 15a-c of Tabata).

In view of the above it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the multi-planar display system of Sullivan in accordance with the teaching of Tabata by supplying the eyeball accommodation to the shift amount calculator to process the right eye and left eye image signals from an image to provide proper binocular parallax regarding the right and left eye images and control state of focus of viewer eyes instantaneously, as

suggested by Tabata (i.e. col. 4, lines 10 – 13 and col. 11, lines 64 – col. 12, lines 10 of Tabata).

Regarding claim 37, the combination of Sullivan and Shevlin teaches, determining accommodation of the viewer eye, as discussed earlier with respect to claim 1 above.

Shevlin is silent in regards to explicit of, "light that is not visible to a human, to measure the accommodation for the eye of the viewer" as specifies in the claim.

Tabata teaches, light that is not visible to a human, to measure the accommodation for the eye of the viewer (please see; col. 11, lines 59 – 66 of Tabata).

In view of the above it would have been obvious to one having ordinary skill in the art at the time of the invention was made to determine the accommodation as taught by Shevlin in accordance with the teaching of Tabata by using a light source for projecting infrared light/rays to viewer eyeball to detect and control state of focus of viewer eyes instantaneously, as suggested by Tabata (i.e. col. 4, lines 10 – 13 of Tabata).

Regarding claim 39, the combination of Sullivan and Shevlin teaches, beam splitter for reflection the light and focusing image (please see; fig. 9, beam splitter 106, page 10, paragraph 0104 of Sullivan, and page 3, paragraph 0063 of Shevlin).

Shevlin is silent in regards to explicit of, "beam splitter so that light from the image source is reflected into an eye of the viewer, while light used by the device for determining the accommodation travels between the device and the eye of the viewer through the beam splitter" as specifies in the claim.

Tabata '309 teaches, beam splitter so that light from the image source is reflected into an eye of the viewer, while light used by the device for determining the accommodation travels between the device and the eye of the viewer through the beam splitter (please see; half mirror, as shown in figs. 2 – 3, beam splitter 12lb and 12la, col. 11, lines 59 – 66 and col. 12, lines 27 – 54 of Tabata).

In view of the above it would have been obvious to one having ordinary skill in the art at the time of the invention was made to determine the accommodation as taught by Shevlin in accordance with the teaching of Tabata by using a beam splitter "e.g. half mirror" to transmit the reflected beams through the beam splitter "e.g. half mirror" to the viewer eye, which would be used to control state of focus of viewer eyes "e.g. focus accommodation of the eyeball" instantaneously, as suggested by Tabata (i.e. col. 4, lines 10 – 13 of Tabata).

Regarding claim 40, the combination of Sullivan and Shevlin teaches, beam splitter for reflection the light and focusing image (please see; fig. 9, beam splitter 106, page 10, paragraph 0104 of Sullivan, and page 3, paragraph 0063 of Shevlin).

Shevlin is silent in regards to explicit of, "beam splitter so that light from the image source is transmitted into an eye of the viewer, while light used by the device for determining the accommodation is reflected into the eye of the viewer by the beam splitter" as specifies in the claim.

Tabata '309 teaches, beam splitter so that light from the image source is transmitted into an eye of the viewer, while light used by the device for determining the accommodation travels between the device and the eye of the viewer through the

beam splitter (please see; half mirror, as shown in figs. 2 – 3, beam splitter 12lb and 12la, col. 11, lines 59 – 66 and col. 12, lines 27 – 54 of Tabata).

In view of the above it would have been obvious to one having ordinary skill in the art at the time of the invention was made to determine the accommodation as taught by Shevlin in accordance with the teaching of Tabata by using a beam splitter "e.g. half mirror" to transmit the reflected beams through the beam splitter "e.g. half mirror" to the viewer eye, which would be used to control state of focus of viewer eyes "e.g. focus accommodation of the eyeball" instantaneously, as suggested by Tabata (i.e. col. 4, lines 10 – 13 of Tabata).

8. Claims 4, 11, 13, 14, 23, 30 and 32 – 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sullivan (US 2002/0163482) in view of Shevlin (US 2003/0086062) further in view of Braun et al. (US 6,133,944).

Regarding claim 4, the combination of Sullivan and Shevlin teaches, determining eye accommodation "e.g. state of focus" of the viewer watching the large depth of focus display, as discussed earlier with respect to claim 1 above (please see; figs. 1, 4 – 7, 9, pages 13 - 14, paragraph 0144 – 0146 of Sullivan, and fig. 1, page 2, paragraph 0028 of Shevlin, indicating eye tracking system for monitoring "e.g. tracking" the look direction and accommodative state of the viewer).

The combination of Sullivan and Shevlin does not explicitly states "measuring a gaze direction of the viewer, and anticipating the accommodation "e.g. focus" of the viewer from the gaze direction".

Braun '944 teaches (please see; col. 2, lines 56 – 64, col. 3, lines 41 – 50, col. 5, lines 16 – 22 and col. 8, lines 59 – 67 of Braun) measuring/determining a gaze direction of the viewer to simulate the operation of viewer eyes focusing "e.g. eye accommodation".

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the display system of Shevlin by measuring/determining a gaze direction of the viewer to simulate the operation of viewer eyes focusing "e.g. eye accommodation" as taught by Braun, to permit multiple users to independently view different views of the same remote scene without interfering with any other viewer's image, as suggested by Braun (i.e. col. 3, lines 12 – 15 of Braun).

Regarding claim 11, the combination of Sullivan and Shevlin teaches, enabling the viewer to provide an input that varies a value of a parameter for at least one of the other dimensions, to affect the image provided to the large depth of focus display (please see figs.1 and 15, user feed back device 58 and interface 14 and page 5, paragraph 0064 for user interaction with the system to affect the image provided to the large depth of focus display, of Sullivan).

Sullivan does not explicitly states, wherein the parameter comprises one of, a) a motion of a camera into a scene comprising the plurality of images; b) an orientation of a camera used to image a scene to produce the plurality of images; and c) a zoom level of a camera used to produce the plurality of images, as specifies in the claim.

Braun '944 teaches one of the alternatives as specifies in the claim, such as; a motion of a camera into a scene comprising the plurality of images (please see, fig. 4B,

motion of a camera "e.g. camera panning" into a scene 452, comprising the plurality of images 454 and 456, as illustrated in fig. 4B of Braun).

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the multi-planar display system of Sullivan by incorporating a panning camera "e.g. motion of camera into a scene" in accordance with the teaching of Braun to permit multiple users to independently view different views of the same remote scene without interfering with any other viewer's image, as suggested by Braun (i.e. col. 3, lines 12 – 15 of Braun).

Regarding claim 13, the combination of Sullivan and Shevlin teaches, plurality of images are pre-prepared for displaying the images having a range of different apparent focus planes to the viewer, as discussed earlier with respect to claim 1 above (please see; figs. 1, 4 – 7, illustrates projecting plurality of images having a range of different apparent focus planes being displayed on multi-planar display 32 to the viewer 12 of Sullivan).

Sullivan is silent in regards to explicit of "capturing a scene with a camera having a variable focus set at a plurality of different focal planes" as specifies in the claim.

Braun '944 teaches plurality of images are pre-prepared by capturing a scene with a camera (please see; figs. 1 – 3, 42, illustrating plurality of images captured by the electronic panning cameras 208, 308, col. 4, lines 65 – col. 5, lines 15 of Braun; it is noted that, using an electronic panning camera to pan and capture images at different focal plane, different focal distance would implies camera having variable focus plane to

be able to focus the camera at different distance/different focal distance to capture images, as illustrated in figs. 1 – 3, 7A-B and 6 of Braun).

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the multi-planar display system of Sullivan by incorporating a panning camera for capturing a scene at different focal plane, different focal distance in accordance with the teaching of Braun to permit multiple users to independently view different views of the same remote scene without interfering with any other viewer's image, as suggested by Braun (i.e. col. 3, lines 12 – 15 of Braun).

Regarding claim 14, the combination of Sullivan and Shevlin teaches, producing the image having the apparent focus plane that tracks the accommodation "e.g. focus" of the viewer, on the large depth of focus display, as discussed earlier with respect to claim 1 above (please see; figs. 1 and 15, multi-planer display system, with apparent focus plane that tracks the accommodation "e.g. focus plane as illustrate in fig. 1, elements 36 – 42 and viewer 12" to be presented to the viewer 12, page 4, paragraph 0053 and page 14, paragraphs 0156 – 0157 of Sullivan).

Sullivan does not explicitly states "by adjusting a focus of a variable focus camera so that the variable focus camera produces the image by imaging a real scene with the focus set at the apparent focus plane" as specifies in the claim.

Braun '944 teaches an electronic panning camera, to pan, tilt and zoom to capture images at different focal plane, different distance, would implies variable focus camera so that the camera panning be able to adjust focus and capture images by

imaging a real scene at different distance/different focal distance as illustrated in (i.e. figs. 1 – 3, 7A-B and 6 of Braun).

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the multi-planar display system of Sullivan by incorporating a panning camera in accordance with the teaching of Braun to permit multiple users to independently view different views of the same remote scene without interfering with any other viewer's image, as suggested by Braun (i.e. col. 3, lines 12 – 15 of Braun).

Regarding claim 23, the combination of Sullivan and Shevlin teaches, determining eye accommodation "e.g. state of focus" of the viewer watching the large depth of focus display, as discussed earlier with respect to claim 1 above (please see; figs. 1, 4 – 7, 9, pages 13 - 14, paragraph 0144 – 0146 of Sullivan, and fig. 1, page 2, paragraph 0028 of Shevlin, indicating eye tracking system for monitoring "e.g. tracking" the look direction and accommodative state of the viewer).

The combination of Sullivan and Shevlin does not explicitly states "measuring a gaze direction of the viewer, and anticipating the accommodation "e.g. focus" of the viewer from the gaze direction".

Braun '944 teaches (please see; col. 2, lines 56 – 64, col. 3, lines 41 – 50, col. 5, lines 16 – 22 and col. 8, lines 59 – 67 of Braun) measuring/determining a gaze direction of the viewer to simulate the operation of viewer eyes focusing "e.g. eye accommodation".

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the display system of Shevlin by measuring/determining a gaze direction of the viewer to simulate the operation of viewer eyes focusing "e.g. eye accommodation" as taught by Braun, to permit multiple users to independently view different views of the same remote scene without interfering with any other viewer's image, as suggested by Braun (i.e. col. 3, lines 12 – 15 of Braun).

Regarding claim 30, the combination of Sullivan and Shevlin teaches, enabling the viewer to provide an input that varies a value of a parameter for at least one of the other dimensions, to affect the image provided to the large depth of focus display (please see figs.1 and 15, user feed back device 58 and interface 14 and page 5, paragraph 0064 for user interaction with the system to affect the image provided to the large depth of focus display, of Sullivan).

Sullivan does not explicitly states, wherein the parameter comprises one of, a) a motion of a camera into a scene comprising the plurality of images; b) an orientation of a camera used to image a scene to produce the plurality of images; and c) a zoom level of a camera used to produce the plurality of images, as specifies in the claim.

Braun '944 teaches one of the alternatives as specifies in the claim, such as; a motion of a camera into a scene comprising the plurality of images (please see, fig. 4B, motion of a camera "e.g. camera panning" into a scene 452, comprising the plurality of images 454 and 456, as illustrated in fig. 4B of Braun).

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the multi-planar display system

of Sullivan by incorporating a panning camera "e.g. motion of camera into a scene" in accordance with the teaching of Braun to permit multiple users to independently view different views of the same remote scene without interfering with any other viewer's image, as suggested by Braun (i.e. col. 3, lines 12 – 15 of Braun).

Regarding claim 32, the combination of Sullivan and Shevlin teaches, plurality of images are pre-prepared for displaying the images having a range of different apparent focus planes to the viewer, as discussed earlier with respect to claim 1 above (please see; figs. 1, 4 – 7, illustrates projecting plurality of images having a range of different apparent focus planes being displayed on multi-planar display 32 to the viewer 12 of Sullivan).

Sullivan is silent in regards to explicit of "capturing a scene with a camera having a variable focus set at a plurality of different focal planes" as specifies in the claim.

Braun '944 teaches plurality of images are pre-prepared by capturing a scene with a camera (please see; figs. 1 – 3, 42, illustrating plurality of images captured by the electronic panning cameras 208, 308, col. 4, lines 65 – col. 5, lines 15 of Braun; it is noted that, using an electronic panning camera to pan and capture images at different focal plane, different focal distance would implies camera having variable focus plane to be able to focus the camera at different distance/different focal distance to capture images, as illustrated in figs. 1 – 3, 7A-B and 6 of Braun).

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the multi-planar display system of Sullivan by incorporating a panning camera for capturing a scene at different focal

plane, different focal distance in accordance with the teaching of Braun to permit multiple users to independently view different views of the same remote scene without interfering with any other viewer's image, as suggested by Braun (i.e. col. 3, lines 12 – 15 of Braun).

Regarding claim 33, the combination of Sullivan and Shevlin teaches, producing the image having the apparent focus plane that tracks the accommodation "e.g. focus" of the viewer, on the large depth of focus display, as discussed earlier with respect to claim 1 above (please see; figs. 1 and 15, multi-planer display system, with apparent focus plane that tracks the accommodation "e.g. focus plane as illustrate in fig. 1, elements 36 – 42 and viewer 12" to be presented to the viewer 12, page 4, paragraph 0053 and page 14, paragraphs 0156 – 0157 of Sullivan).

Sullivan does not explicitly states "by adjusting a focus of a variable focus camera so that the variable focus camera produces the image by imaging a real scene with the focus set at the apparent focus plane" as specifies in the claim.

Braun '944 teaches an electronic panning camera, to pan, tilt and zoom to capture images at different focal plane, different distance, would implies variable focus camera so that the camera panning be able to adjust focus and capture images by imaging a real scene at different distance/different focal distance as illustrated in (i.e. figs. 1 – 3, 7A-B and 6 of Braun).

In view of the above, it would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the multi-planar display system of Sullivan by incorporating a panning camera in accordance with the teaching of Braun

to permit multiple users to independently view different views of the same remote scene without interfering with any other viewer's image, as suggested by Braun (i.e. col. 3, lines 12 – 15 of Braun).

Conclusion

9. Andrew T. Duchowski reference "Binocular Eye tracking in virtual reality for inspection training" is considering pertinent to applicant's disclosure.

Contact

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Behrooz Senfi whose telephone number is 571-272-7339. The examiner can normally be reached on M-F 7:00-3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on 571-272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

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Behrooz Senfi
Examiner
Art Unit 2621